

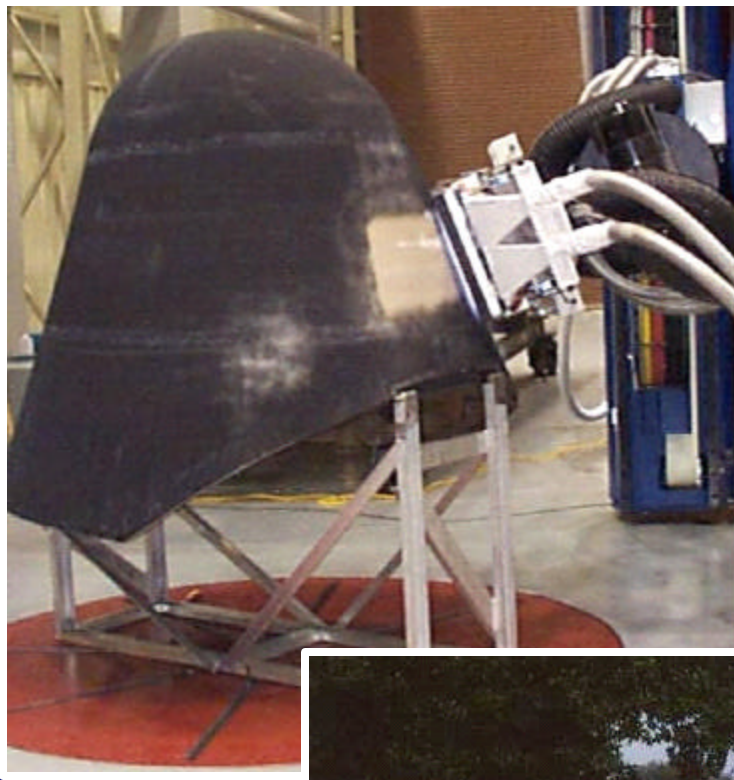


# The MONITOR

Aeronautical Systems Center (ASC/ENVV)

Vol. 8 No. 9, Spring 2004/AFMC Public Release Number 0404

Bldg 8 ♦ 1801 Tenth St ♦ Suite 2 ♦ WPAFB, OH 45433-7626 ♦ Commercial: (937) 255-3566 ♦ DSN 785-3566 ♦ Fax: (937) 255-4155



Lessons Learned from Transition of FLASHJET® at WR-ALC...  
See [Page 13](#)

# Table of Contents...

<b>IN THIS ISSUE .....</b>	<b>3</b>
<b>POLICY, PLANS &amp; PROGRAMS .....</b>	<b>5</b>
Department of Defense (DoD) and Air Force Directives and Instruction for the Environmental Manager .....	5
An Overview of the F-16 System Program Office (SPO) Environment, Safety, and Health (ESH) Program .....	9
<b>SUCCESS STORIES, TECHNOLOGY TRANSFER &amp; MEASUREMENT OF SUCCESS .....</b>	<b>13</b>
Measuring Success: Lessons Learned from the Transition of the FLASHJET® Coating Removal Process at Air Force Materiel Command .....	13
Prekote: An Alternate Solution to the Use of Chrome Conversion Coating .....	18
<b>INFORMATION CROSS-FEED .....</b>	<b>20</b>
The Department of Defense (DoD) Establishes a Forum to Address Corrosion .....	20
2004 Deicing Work Group Held in Las Vegas, Nevada .....	21

The MONITOR is a quarterly publication of the Headquarters Air Force Materiel Command (AFMC) Pollution Prevention Integrated Product Team (P2IPT) dedicated to integrating environment, safety, and health related issues across the entire life cycle of Air Force Weapon Systems. AFMC does not endorse the products featured in this magazine. The views and opinions expressed in this publication are not necessarily those of AFMC. All inquiries or submissions to the MONITOR may be addressed to the Program Manager, Mr. Frank Brown.

**Aeronautical Systems Center  
(ASC/ENVV)**

Bldg. 8 • 1801 Tenth Street • Suite 2 • Wright-Patterson AFB, OH 45433-7626  
Commercial: (937) 255-3566  
DSN: 785-3566  
FAX: (937) 255-4155

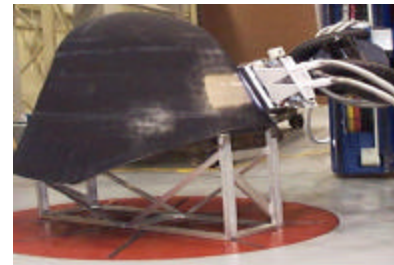
## IN THIS ISSUE



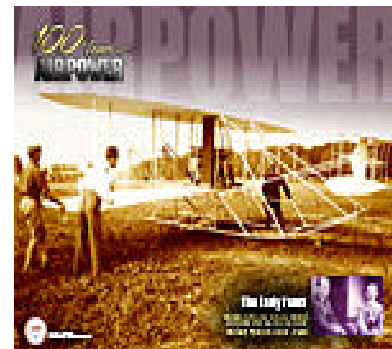
The **POLICY, PLANS, & PROGRAMS** section summarizes some of the main Department of Defense (DoD) and Air Force (AF) Environment, Safety, and Health (ESH) drivers for weapon systems. We also feature, the F-16 Program's efforts to integrate ESH into the systems engineering process. The F-16 is a highly diverse weapon system with a broad reach across the Air Force. The Program has established an Environmental Network System which tracks key issues under the National Environmental Policy Act (NEPA), Environmental Compliance, Safety and Health, Hazardous Materials & Pollution Prevention. Additionally, the program integrates the relationship between these elements and the acquisition/systems engineering process. All this information is tracked and communicated through its Programmatic Environmental, Safety and Health Evaluation (PESHE) and the Environmental Network.



The **SUCCESS STORIES, TECHNOLOGY TRANSFER & MEASUREMENT OF SUCCESS** section features some of the Headquarters Air Force Materiel Command Pollution Prevention Integrated Product Team (HQ AFMC P2IPT) funded technologies that have been successfully transitioned and recognizes a few of the key personnel that have championed these technologies. The return on investment and reduction in hazardous material usage and/or waste stream reduction is provided, where this data is available.



Under **INFORMATION CROSS-FEED** we begin to feature websites that may be of value to the weapon system ESH community. Dave Ellicks, Air Force Corrosion Program Office, informed the MONITOR staff about the DoD Corrosion Exchange, which is described in this issue. We encourage our readers to join this community of practice, since corrosion control is a primary driver for pollution prevention. This website/platform provides us an opportunity to gather information and exchange knowledge rapidly.



Mr. Ron Scharven is the new AFMC Public Affairs Specialist who will support review of the MONITOR Magazine for AFMC. He replaces Mr. Larry Glidewell. Ron's background includes the creation of Restoration Advisory Boards (RABs) at Laughlin and Lackland AFBs and working on the RAB at Kelly AFB. Ron retired after 28 years on active duty with the Air Force of which the last 21 was spent as a Broadcaster and Public Affairs Superintendent.

The following AFMC Bioenvironmental Engineers have been added to the MONITOR mailing list, at the request of Major Carolyn Macola, AFMC/SG:

- ◆ LtCol Brian Blazicko 74 AMDS/SPGB;
- ◆ Capt Stephen Boglarski MDOS/SGOAB;
- ◆ Capt Goldie Boone MDS/SGPB;
- ◆ Major Darrin Curtis AMDS/SGPB;
- ◆ Major Gregory Frick AFIOH/CD;
- ◆ Col John Garland USAFSAM/IE;
- ◆ LtCol Gordon Scott AMDS/SGPB;
- ◆ Lori Ann Hill 78 MDG/SGPB;
- ◆ Col Mohammad Hossain AFIOH/RS;
- ◆ LtCol Jeffrey Mason 78 MDG/SGPB;
- ◆ Hank Personius 78 MDG/SGPB;
- ◆ LtCol Bryan Ramstack 72 AMDS/SGPB;
- ◆ Major Cynthia Redelsperger AFIA/SGI;
- ◆ Lawrence Sella 72 MDG/SGPB;
- ◆ LtCol Robert Tetla 96 AMDS/SGPB;
- ◆ LtCol Henry Thompson 74 AMDS/SGPB;
- ◆ MSgt Whitney Wildfeuer AEDC/SDG;
- ◆ Capt Richard Woodruff DET 3 AFIOH/CDE;
- ◆ Msgt Maria Aresbanez DET 3 AFIOH/CS;
- ◆ MSgt David Baker 377 AMDS/SGPB;
- ◆ MSgt Rafael Charris;
- ◆ CMSgt Adam Germond 72 AMDS/SGP;
- ◆ SMSgt Dennis Hall 72 MDG/SGP;
- ◆ SMSgt Rick Johnson AMDS/SGPB;
- ◆ MSgt Eddie McGee 72 MDG/SGPB;
- ◆ MSgt Michael McGurl 75 AMDS/SGPB;
- ◆ MSgt Michael Middleton 311 MDS/SGPB;
- ◆ MSgt Roberto Munda 78 MDG/SGPB;
- ◆ TSgt Kenneth Rennekamp 66 MDOS/SGOAB;
- ◆ MSgt Roberto Rolon 96 AMDS/SGPB;
- ◆ MSgt Steven Segebart 74 AMDS/SGPB;
- ◆ MSgt Brian Whitehouse 66 MDOS/SGOAB;
- ◆ Capt Timothy Allmann AFRL/MLSC;
- ◆ Capt Wilfredo Cortez AFRL/PROF;
- ◆ LtCol Forrest Cunningham WR-ALC/EN;
- ◆ Major E. Philip Goff AFOTEC Det 1/DO;
- ◆ Major Carolyn Jacobson ASC/YCE;
- ◆ Edward Marchand ASC/TM;
- ◆ Major Sheila Neumann 412 TW/ENFH;
- ◆ LtCol Mark Smith AFCEE/TD;
- ◆ LtCol Laura Stahl 325 ADS/SGGB;
- ◆ Capt Scott Steigerwald AFRL/MLOF;
- ◆ LtCol Andrew Widger AFRL/HEPC;
- ◆ Col Patrick Johnson HQ AFMC/SGPE;
- ◆ Colleen Lovett HQ AFMC/SGPE;
- ◆ Major Kevin Martilla HQ AFMC/SGPE;
- ◆ LtCol Wade Weisman HQ AFMC/SGPE;
- ◆ MSgt Cynthia Wiederholt HQ AFMC/SGPE.

If you would like to be included to the MONITOR distribution list, please contact Mr. Frank Brown at [Frank.Brown@wpafb.af.mil](mailto:Frank.Brown@wpafb.af.mil) or DSN 785-3566. ●



## POLICY, PLANS & PROGRAMS

### DEPARTMENT OF DEFENSE (DoD) AND AIR FORCE DIRECTIVES AND INSTRUCTION FOR THE ENVIRONMENTAL MANAGER

Tables 1 and 2 provide a listing of the Environment, Safety, and Health (ESH) Department of Defense Directives and Instructions (DoDD/DoDI) and the Air Force Directives and Instructions (AFPD/AFIs), respectively, that a Manager may consider as part of integrating ESH into the weapon system life cycle.

The drivers listed in these two tables may have a high-to-medium impact on the responsibilities assigned to the Environmental Manager and the Program's Environmental Working Group. If you need more details on any of these regulations, please visit the following website: <https://www.afmc-mil.wpafb.af.mil/pdl/pubs.htm>.

**Table 1. WS Regulatory Drivers (DoDDs/DODIs)**

DODDs/DODIs	Title	Summary of Action	Date of Action
DODI 5000.2	Operation of Defense Acquisition System	Establishes a simplified and flexible management framework for translating mission needs and technology opportunities, based on approved mission needs and requirements, into stable, affordable and well-managed acquisition programs that include weapon systems and automated information systems. Authorizes Milestone Decision Authorities to tailor procedures to achieve cost, schedule and performance goals.	5/12/2003
DODD 5000.2	The Defense Acquisition System	This directive along with DODI 5000.2 provides management principles and mandatory policies and procedures for managing all acquisition programs.	5/12/2003
DODI 6055.7	Accident Investigation, Reporting, and Record Keeping	Reissues and updates reference (a) to: Inform the Secretary of Defense on the loss of assets through accidents and comply with the Occupational Safety and Health Administration's (OSHA) reporting requirements in accordance with E.O. 12196 and 29 CFR 1960.	10/3/2000
DODD 4715.12	Environmental and Explosive Safety Management on Department of Defense Active and Inactive Ranges Outside the U.S.	Establish policy and assigns responsibilities for sustainable use and management of DoD's active and inactive ranges located outside the United States and protection of DoD personnel and public from explosives hazards.	8/17/1999
DODD 4715.11	Environmental and explosive Safety Management On Department Of Defense Active And Inactive Ranges Within The U.S.	Establish policy and assigns responsibilities for sustainable use and management of DoD's active and inactive ranges located within the United States and protection of DoD personnel and public from explosives hazards.	8/17/1999

**Table 1. WS Regulatory Drivers (DoDDs/DODIs)**  
(Continued)

<b>DODDs/DODIs</b>	<b>Title</b>	<b>Summary of Action</b>	<b>Date of Action</b>
DODI 6055.1	DoD Safety and Occupational Health Program	Updates policies, procedures, and responsibilities for administering a comprehensive DoD SOH program under reference.	8/19/1998
DODI 4715.4	Pollution Prevention	Implements policy, assigns responsibility, and prescribes procedures for implementation of pollution prevention programs throughout the Department of Defense and Authorizes the publication of "Guide for Qualified Recycling Programs."	6/18/1996
DODI 4715.9	Environmental Planning and Analysis	Implements policy and assigns responsibilities for integration of environmental considerations into DoD activity and operational planning.	5/3/1996
DODI 4715.3	Environmental Conservation Program	Implements policy, assigns responsibilities, and prescribes procedures for the integrated management of natural and cultural resources on property under DoD control.	5/3/1996
DODI 4715.6	Environmental Compliance	Implements policy, assigns responsibility, and prescribes procedures as established for achieving compliance with applicable Executive Orders (E.O.s) and Federal, State, inter-state, regional, and local statutory and regulatory environmental requirements.	4/24/1996
DODD 4715.1	Environmental Security	Establishes policy for environmental security within DoD. Establishes: Defense Environmental Security Council, the Environment, Safety, and Occupational Health Policy Board, DESC Committee structure, Armed Forces Pest Management Board council and committee, Defense Pest Management Information Analysis Center.	2/24/1996
DODI 6055.5	Industrial Hygiene and Occupational Health	Establish uniform procedures to recognize and evaluate health risks associated with exposure to chemical, physical, and biological stresses in DoD workplaces and establish procedures for the management of an Employee Medical File System and industrial hygiene surveillance records.	1/10/1989
DODD 1000.3	Safety and Occupational Health Policy for DoD	Updates established policy and guidance for the prevention of mishaps throughout DoD. Assigns broad responsibilities to strengthen defense readiness through such prevention. Provides for implementation within DoD of applicable public laws, executive orders and Government regulations concerning safety and occupational health.	3/29/1979

**Table 2. WS Regulatory Drivers (AFPDs/AFIs)**

AFPDs/AFIs	Title	Summary of Action	Date of Action
AFI 13-201	Air Force Airspace Management (71)	Provides guidance and procedures for developing Special Use Airspace. It applies to activities that have responsibility for using airspace. It establishes practices to decrease disturbances from flight operations that cause adverse public reactions.	9/20/2001
AFI 13-212, vol. 1	Range Planning and Operations (72)	Provides guidance for planning, operations, management, safety, equipment, facilities, and security of the Air Force ranges.	8/7/2001
AFPD 90-9	Operational Risk Management	Establishes the Air Force Operation Risk Management Program to maximize mission effectiveness and sustain readiness.	4/1/2000
AFI 90-901	Operational Risk Management (62)	Requires the implementation and sustaining of ORM throughout the Air Force by HQ Air Force staffs, MAJCOMs, DRUs, and FOAs.	4/1/2000
AFPD 63-12	Assurance of Operational Safety, Stability, and Effectiveness (59)	This policy establishes the Air Force's requirement for operation safety, stability and effectiveness and includes the Air National Guard and the Air Force Reserve both for a system's and end item's entire operational life.	2/1/2000
AFI 63-1201	Assurance of Operational Safety, Stability, and Effectiveness (61)	Defines a process for implementing AFPD 63-12 as applied to Air Force product lines, including Air National Guard and Reserve. Also requires compliance with AFMAN.	2/1/2000
AFI 91-202	The US Air Force Mishap Prevention Program (63)	Establishes mishap prevention program requirements, assigns responsibilities for program elements, and contains program management information for all Air Force personnel.	8/1/1998
AFPD 65-6	Budget	This directive establishes policies for complying with applicable laws and DoD funding guidance in all phases of the budget cycle, and which govern the formal process of prioritizing and applying appropriated funds to support Air Force missions.	5/1/1998
AFI 65-601	Budget Guidance and Procedures (74)	This instruction implements the budget corporate review process for AFPD 65-6, Budget. It establishes budget corporate review procedures for Headquarters United States Air Force, the Air Force Reserve, and the Air National Guard.	5/1/1998
AFI 32-7064	Integrated Natural resources Management Plan	This is an explanation of how to manage natural resources found on Air Force property in compliance with all standards. For installations outside the US, the FGS and OEBGD take precedence over this standard.	8/1/1997
AFI 32 - 7086	Hazardous Materials Management	The purpose of the Hazmat Pharmacy Program is to provide Air Force installations with a standard way to manage HAZMAT procurement and use and comply with ESOH requirements.	8/1/1997

**Table 2. WS Regulatory Drivers (AFPDs/AFIs) (Continued)**

AFPDs/AFIs	Title	Summary of Action	Date of Action
AFI 32 - 4013	Hazardous Material Emergency Planning and Response Guide	This instruction provides guidance for establishing the Hazardous Materials (HAZMAT) Emergency Planning and Response Program at Air Force installations to meet Federal, state and local regulatory requirements. It covers HAZMAT emergency planning, hazards analysis, capability assessment, post emergency response, notification, and reporting. It also describes a recommended process for developing an installation-specific Hazardous Material Emergency Planning and Response Plan (HAZMAT Plan).	8/1/1997
AFI 91-301	AF AFOSH Program	This instruction implements AFPD 91-3, Occupational Safety and Health. It outlines the Occupational and Environmental Safety, Fire Protection and Health (AFOSH) Program.	6/1/1996
AFI 32 - 7061	The Environmental Impact Analysis Process	This instruction implements the Air Force Environmental Impact Analysis Process and provides procedures for environmental impact analysis both within the United States and abroad. Because the authority for, and rules governing, each aspect of the Environmental Impact Analysis Process differ depending on whether the action takes place in the United States or outside the United States, this instruction provides largely separate procedures for each type of action. Consequently, the main body of this instruction deals primarily with environmental impact analysis under the authority of the National Environmental Policy Act of 1969 (NEPA) (Public Law 91-190, 42 U.S.C. §§4321-4347), while the primary procedures for environmental impact analysis of actions outside the United States in accordance with Executive Order 12114, Environmental Effects Abroad of Major Federal Actions.	1/24/1995
AFI 32-7065	Cultural Resources Management	Sets guidelines for protecting and using cultural resources in the US and in US territories.	6/13/1994
AFI 32- 7080	Pollution Prevention Program	The Air Force takes a leadership role in preventing pollution by reducing the use of hazardous materials and the release of pollutants into the environment. Preventing pollution requires a proactive and dynamic management approach because prevention achieves environmental standards through source reduction rather than "end-of-pipe" treatment.	5/12/1994
AFI 91-302	Air Force Occupational and Environmental Safety, Fire Protection, and Health standards (AFOSH) (65)	This instruction implements AFPD 91-3, Occupational Safety and Health. It establishes a specialized publication system for issuing, updating, and indexing AFOSH standards. In conjunction with the US Air Force Mishap Prevention Program, these standards ensure all Air Force workplaces meet Federal safety and health requirements.	4/18/1994
AFPD 91-2	Safety Program	This directive establishes policies for the AF's approach to safety.	9/28/1993

## AN OVERVIEW OF THE F-16 SYSTEM PROGRAM OFFICE (SPO) ENVIRONMENT, SAFETY, AND HEALTH (ESH) PROGRAM

The F-16 System Program Office (SPO) mission is to “develop, acquire, modify, and sustain the world’s best weapon system at the lowest cost.” F-16 System SPO personnel are located at Aeronautical Systems Center (ASC/YP) and at Ogden Air Logistics Center (OO-ALC/YP). The SPO personnel also provide program oversight to 13 countries that operate the aircraft.

This article provides an overview of the F-16 Environment, Safety, and Health (ESH) Program.

### System Purpose & Description

The F-16 is designated an ACAT II Program and reached Milestone IV in 1990. The F-16 is still in production at Air Force Plant 4 in Ft. Worth, Texas. Demilitarization and disposal is the next major phase for the F-16 weapon system used by the US Air Force (USAF). However, the F-16 fleet will remain in worldwide service beyond 2030.

The F-16 is a multi-role fighter and serves in both air-to-air and air-to-surface combat during the initial stages of a conflict. The F-16 has a combat range of 575 miles and is flown by a single pilot at a maximum speed of Mach 2. The armament associated with this aircraft includes one M61A1 20 mm multi-barrel cannon, wing tip mounted missiles, and seven other external store stations for fuel and munitions.

### Program Master Schedule

The F-16 SPO’s acquisition strategy has been to procure a continually updated aircraft under the Multi-National

Staged Improvement Program. As a result, the F-16 aircraft’s operational capability has been enhanced through “block” change improvements. These changes have progressed from the Block 1 and 5 Full Scale Development aircraft to the current Block50/52 aircraft, which reached Initial Operating Capability in 1992.

The F-16 production is expected to go beyond 2010 from purchases of Block 50 aircraft by the USAF, European

#### TIMELINE:

- ◆ 1975 - First contract awarded to General Dynamics
- ◆ 1976 - First Flight Initiated
- ◆ 1977 - Full scale production initiated
- ◆ 1979 - First operational F-16/A delivered Hill AFB
- ◆ 1990 - Reached Milestone IV (current)
- ◆ 2010 - Production anticipated to go beyond this date
- ◆ 2030 - Anticipated to remain in worldwide service beyond this date

#### MODIFICATIONS:

- ◆ Load carrying capability
- ◆ Engine thrust
- ◆ Armament carrying capability
- ◆ Avionics modernization (hardware & software)

#### FUTURE MODIFICATIONS:

- ◆ Integrated electronic warfare system
- ◆ Agile beam radar



Partners, and Foreign Military Sales (FMS). Over 3,500 F-16s have been manufactured in the last 23 years.

### F-16 SPO ESH Policy

The F-16 ESH Policy can be summarized as follows:

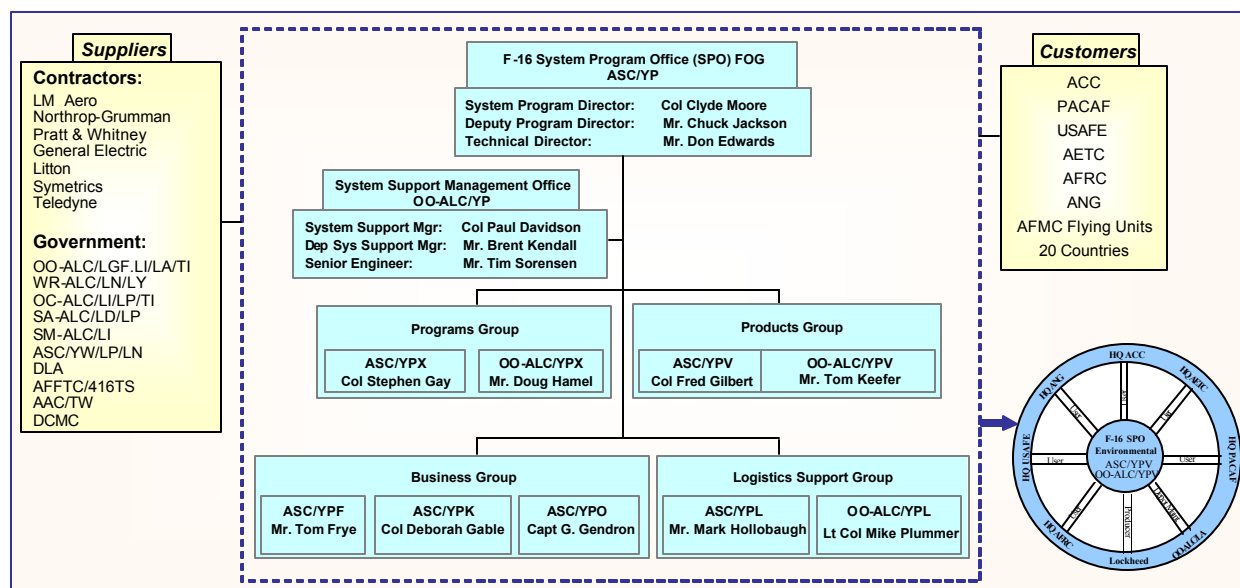
*“It is the policy of the F-16 SPO to comply with the ESH elements of*

ment Manufacturer (OEM), Lockheed Martin, supports reduction of hazardous material usage in the F-16 production and maintenance processes. On-site contract support is also provided at OO-ALC to assist with integration and addressing F-16 related environmental issues. The success of the F-16 SPO to cross-feed lessons learned between production and maintenance processes is largely attributed to the on-site contract support.

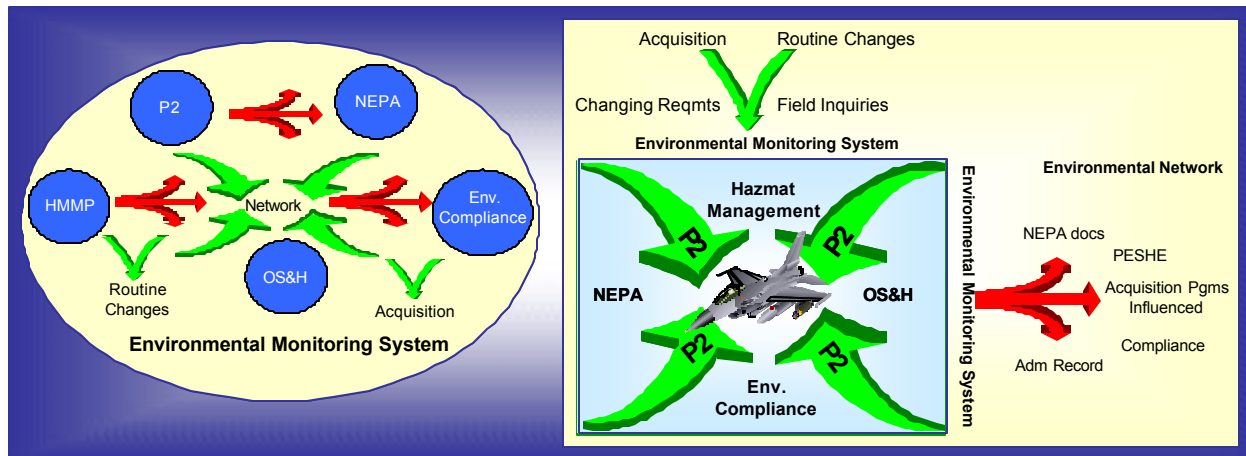
## F-16 SPO ESH Responsibilities

## F-16 SPO ESH Approach & Methodology

The cornerstone of the F-16 Program ESH approach is the EMS. The EMS has auto-



mated the interaction between the ESH DoDI 5000.2 elements and the acquisition and routine change processes to ensure adequate environmental review. The input and outputs to the EMS, as well as the interactions between these elements, are shown below.



The F-16 SPO ESH Program ensures integration across the ESH elements and acquisition process through this approach. The associated risks are tracked, mitigated, and summarized in the Programmatic Environment, Safety, and Health Evaluation (PESHE).

### F-16 ESH Goals & Objectives

The main objectives related to the EMS include the following:

- ◆ Ensure zero disconnects between the various ESH elements of DoDI5000.2
- ◆ Ensure there are zero changes made to the F-16 weapon systems that are not first given an ESH evaluation.

The specific goals to ensure ESH integration into systems engineering and through the acquisition elements include the following:

- ◆ Maintain an Administrative Record of environmental reviews performed for acquisition programs for future references.
- ◆ Maintain and recommend environmental contract language statements to acquisition programs.
- ◆ Ensure the tenants of NAS 411 apply to all contracts.
- ◆ Ensure that the Configuration Control Board (CCB) checklist includes a requirement for ESH Review (NEPA, Environmental Compliance, Safety and Occupational Health, and Pollution Prevention/Hazardous Materials).
- ◆ Use the F-16 Environmental Network to obtain user feedback on all ESH Programs and to identify additional risks.

## Status of the F-16 ESH Program

The F-16 ESH Program has identified and mitigated all potential ESH risks to the program. Feedback and mitigation of risk is monitored through the F-16 Environmental Network and also tracked in the PESHE.

The key process that ensures the ESH is integrated into the systems engineering process for the F-16 SPO is the CCB checklist which triggers compliance with the elements of DoDI5000.2 (NEPA, Environmental Compliance, Safety and Occupational Health, and Pollution Prevention/Hazardous Materials) for new programs and/or actions. The checklist requires Program Managers to coordinate with the F-16 Environmental Manager for all new actions. Additionally, specific contract language ensures that the tenants of NAS 411 are incorporated into contracts.

---

*The key process that ensures the ESH is integrated into the systems engineering process for the F-16 SPO is the CCB checklist which triggers compliance with the elements of DoDI5000.2 (NEPA, Environmental Compliance, Safety and Occupational Health, and Pollution Prevention/Hazardous Materials) for new programs and/or actions.*

---

Historically, the F-16 SPO has placed a major emphasis on hazardous material reduction through pollution prevention. The F-16 has funded over \$16M worth of hazardous material reduction initiatives including manufacturing and sustainment processes and environmentally advantaged materials on the weapon system itself. Most of these projects have been completed. The program is currently preparing for flight-testing of new zero VOC/HAP infrared topcoat and a new low VOC/HAP radar absorbing material coating. Additionally, the F-16, in concert with the U-2, is working with Air Force Research Laboratory (AFRL) to find an alternative to hydrazine. Details related to the F-16 SPO Funded projects can be found in the Solutions Database at [https://www.en.wpafb.af.mil/p2\\_solutions/p2\\_solutions.asp](https://www.en.wpafb.af.mil/p2_solutions/p2_solutions.asp).

If you would like additional information about the F-16 ESH Program, please contact Ms. Mary Wdyerski at 937-656-6178 or Mr. Paul Hoth at 801-775-4889. ●



## SUCCESS STORIES, TECHNOLOGY TRANSFER & MEASUREMENT OF SUCCESS

### MEASURING SUCCESS: LESSONS LEARNED FROM THE TRANSITION OF THE FLASHJET® COATING REMOVAL PROCESS AT AIR FORCE MATERIEL COMMAND



Headquarters Air Force Material Command Pollution Prevention Integrated Product Team (HQ AFMC P2IPT) has, in part, funded the transition of the FLASHJET® Coating Removal to Warner Robins Air Logistics Center (WR-ALC). FLASHJET® is a “clean and green” pollution prevention (P2)

solution to paint coatings removal. The process does not use any chemicals or generate Hazardous Air Pollutants (HAPs). Additionally, hazardous waste disposal from this process is minimal to none. FLASHJET® helps to comply with the National Emission Standard (NESHAP) and the Expanded OSHA Standards by not using hazardous materials or creating a hazardous waste/emission during the stripping process.

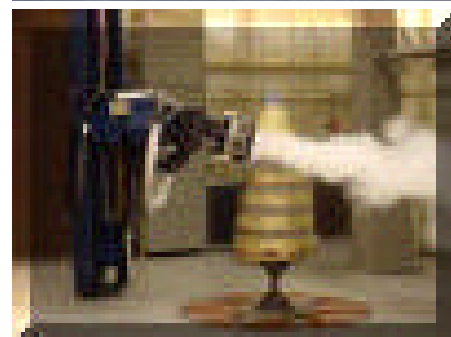
Details regarding the AFMC funded portion of this technology transfer effort are documented in the *Solutions* Database and the lessons learned from the successful implementation of this technology are further discussed in this article.

#### Background

The FLASHJET® system, developed by the former McDonald Douglass Aerospace Company (now Boeing), has combined the application of two known technologies, **Xenon Flash Lamp** and **Carbon Dioxide (CO2) Pellets**, to remove paint coatings from metallic and composite substrates. In simple terms, high- energy fluorescent bulbs from the flash lamp heat the paint and turn it into ash while the carbon dioxide pellets clean and cool the surface. A robotic system with a high-powered vacuum collects the ash generated and filters out contaminants. **Carbon dioxide and water are the only exhaust generated from this process. The filters are tested for hazardous waste characteristics and disposed as required from the analysis.**

The FLASHJET® Coating Removal Process was first tested on boron/epoxy F-15 vertical stabilizers by the Air Force at WR-ALC. A Strategic Environmental Research and

Development Program (SERDP) effort further validated the technology through extensive panel testing on metallic and composite substrates for the Air Force and the Navy. In 1997, funding was obtained from Aeronautical Systems Center, Pollution Prevention Branch (ASC/ ENVV) and HQ AFMC P2IPT to support the installation of the FLASHJET® System at WR-ALC. The installation and verification of system requirements for the FLASHJET® prototype were completed in 2000. The FLASHJET® System at WR-ALC is used to remove



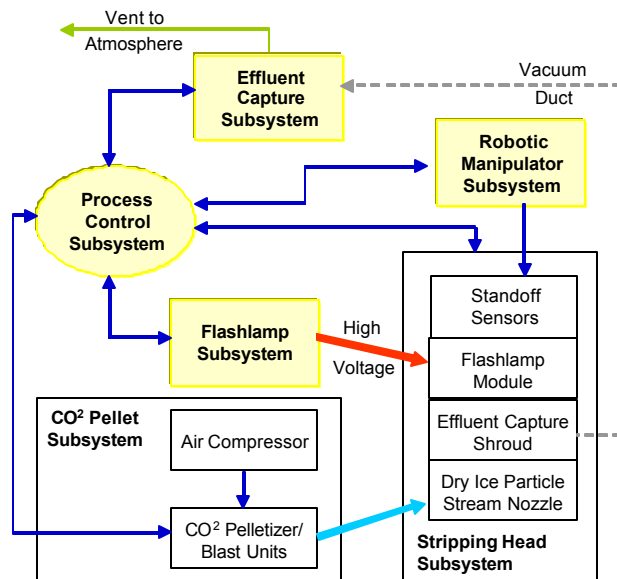
coatings from most composite and radomes components. The FLASHJET® system will strip candidate component parts on the F-15 (torque box, flight controls and radomes); C-130 combat talon II radome and C-17 critical components.

### FLASHJET® Coating Removal System Description

The FLASHJET® Coating Removal System consists of common components (i.e., FLASHJET® System), robot solutions, and facilities. The FLASHJET® System, including the robot solution used at WR-ALC, is described below. New construction or adapting an existing facility is a part of a successful technology transition process. A new facility to house the FLASHJET® was constructed at WR-ALC.

### FLASHJET® System

The subsystems of FLASHJET® process include the following:



- ◆ **Flashlamp** - consists of a high-energy pulsed power supply, de-ionized water-cooling system, cooling water lines, and high-energy power cable. The Flashlamp in the Stripping Head Subsystem provides the

pulsed-light energy necessary for ablation of the surface coating.

- ◆ **CO2 Pellet** - consists of the liquid CO2 storage vessel, pelletizer and blast units, air compressor/aftercooler, air dryer, oil/water separator, receiver and hoses for delivery of clean high-pressure blast air and dry ice particles to the nozzle assembly. The dry ice particle stream sweeps the soot residue from ablation of the coating, provides substrate cooling and a CO2 rich atmosphere, which prevents combustion within the effluent capture shroud.
- ◆ **Effluent Capture Systems (ECS)** - consists of a motor and fan vacuum source that is connected to a combination of traveling aperture (zipper ducts), rigid ducting, flexible ducting, and the Stripping Head Assembly ECS duct and shroud. The ECS collects the effluent from the stripping process. The effluent is routed through the ECS large particle collector, blower section (motor/fan), pre-filters, HEPA filters, and the activated charcoal "tub scrub". These filtration stages collect virtually all particulate matter and neutralize gaseous compounds so that the output of the tub scrub is extremely clean and proven environmentally safe.
- ◆ **Robotic Manipulator** – WR-ALC uses the Gantry Robot Subsystem that controls all movement of the Stripping Head. The robotic manipulator consists of a Gantry Assembly that provides "X," "Y," and "Z" directional travel, a "Z" mast arm which allows extended reach of 8 feet rotationally about the "Z" axis, a Wrist Assembly that provides yaw, pitch, and roll orientations, and a Robot Controller Assembly. The stripping head is physically mounted to the Wrist Assembly.
- ◆ **Process Control** - consists of a Process Controller Assembly and a Remote Operator Station and controls all the subsystems, such as the CO2 Pellet, Flashlamp, Stripping Head, Effluent Capture, and Robotic Manipulator.

- ◆ **Stripping Head** - consists of the dry ice particle stream nozzle assembly, color sensor assembly, flashlamp module, effluent capture duct and shroud, collision sensors, standoff distance sensors, and zone feature lasers.

## Measuring Success

The successful transition of this P2 technology has provided benefits to both the Department of Defense (DoD) and the commercial sector. Today, the FLASHJET® System is operational in six locations.

Location	System Type/Use	Operational Date
Flash Tech Inc. Hazelwood, MO	Gantry Type Used as for Development and Testing	February 1995
Boeing Helicopter Systems Mesa, AZ	Gantry Type Used on AH-64 Apache	May 1996
Naval Air Station Kingsville, TX	Gantry Type Used as on T45A Goshawk Trainer	July 1998
Singapore Technologies Singapore	Mobile Type Prototype Used on C-130 Hercules	March 1999
Corpus Christi Army Depot Corpus Christi, TX	Gantry Type Used on AH-64 Apache, UH-60 Blackhawk, CH-47 Chinook, UH-1 Huey, & AH-1 Cobra	October 1999
Warner Robins-ALC Robins AFB, GA	Gantry Type with Turntable Used on F-15 Eagle Radomes and Other Components	November 2000

The transition of the FLASHJET® System at WR-ALC required an investment of approximately over \$3.7 million from 1997 - 2000. Based on a project validation conducted by AFMC in 2002, the FLASHJET® process at WR-ALC has a projected annual savings of \$900,000 per year and an annual reduction of 22,000 gallons of methylene chloride and 2,300 gallons of methyl ethyl ketone (MEK).

The economic benefits of the FLASHJET® Process are further enhanced by its performance and environmental benefits. WR-ALC can remove coatings from radomes and composites without using chemicals or hand sanding. The new method increases worker safety and prevents pollution. It also extends the life of valuable parts, ultimately saving valuable resources.

The work environment for an operator is significantly enhanced through the use of

FLASHJET®. The FLASHJET® system requires less Personal Protective Equipment (PPE) for the operator since the process does not release hazardous or toxic emissions. The FLASHJET® process is fully automated. Operators are shielded from the process in a control room and are not exposed to any hazardous media (see photographs on [page 16](#)). FLASHJET® is operator friendly, has a stripping rate of approximately 270 square feet per hour, and removes surface paint faster than Plastic Media Blast (PMB).

## Lessons Learned from Technology Transition of FLASHJET® Coating Removal Process

1. **A Model Example for P2 Technology Transition:** The FLASHJET® System follows the model of other similar successful P2 technology transition initiatives, where

the initial research and development of the technology was first conducted by the Original Equipment Manufacture

period of time and even then the full adoption requires continued effort for technology transition outreach.



*Typical Blast or Chemical Media Operator at Work*



*Typical Blast Media Work Environment*



*Typical FLASHJET Operator at Work*



*Typical FLASHJET Work Environment*

(OEM) and then subsequently supported by the federal government. Both SERDP and the Environmental Technology Certification Program (ESTCP) funded the development and transition of this technology in the 1990s. Specific services then provided the resources to facilitate procurement, installation, and operation of the technology. The success of the transition of FLASHJET® has created a new company, Flash Tech, Incorporated, Inc., Hazewood, MO which ensures continued technology support and transition to a larger industrial complex. This is an example of how an investment in a P2 technology can result in technology commercialization that has benefits to the overall economy. However as in the case of the FLASHJET® System, the investment has often to be made over a significant

## **2. A Long Term Commitment of Resources to Technology Transition is Critical to Success:**

It is important to realize, as in the case of the FLASHJET® System, that the challenges in the transition lie not only in development of the innovative technology process (i.e., combination of the Flashlamp and Carbon Dioxide) but also all the infrastructure and subsystems that support it. In reality, the FLASHJET® System consists of three elements that include the common components, the robotic solutions and associated facilities.

The demonstration/validation of the process change and the subsequent Technical Order (TO) modification is only the first step. When supporting a technology for transition, a funding

commitment to support its development over possibly a ten- year period is often required. Although we often claim a success, a second look indicates that the “operational system” continues to undergo fine-tuning and upgrades well beyond the time a successful transition is claimed. If continued support is not provided, the end result can be the purchase of hardware which loses its utility. One of the reasons for the successful transition of the FLASHJET® process was that Program Management support and funding for the project was provided by ASC/ENVV and WR-ALC/TIE through the whole course of the project.

### 3. **Technology Champions to Advocate Technology & Management Issues:**

The transition process is long, iterative, and requires constant input from the stakeholders and operators. The technical challenges to the process change have to be addressed side by side with user concern. Adoption of the technology can be hindered by not addressing or understanding concerns of the operator, the engineer, the Program Manager, or other stakeholders. These concerns can vary from operational consideration, to engineering changes, to business case analysis.

Generally, successful P2 technology transition requires a Technical Champion, usually an Engineer, that is available to addresses users concerns on a day-to-day basis and over the sustained period of technology adoption. Richard Slife, WR-ALC/MAPE continues to provide this support for the FLASHJET® System at WR-ALC as does Richard Buchi for Prekote (see related article on [page](#)

18). In the case of FLASHJET®, Charles Valley’s support ensured sustained funding through the partnership established between ASC and WR-ALC.

### **Additional AFMC Opportunities for Technology Transition**

FLASHJET® is a proven P2 technology that still has opportunities for transition with AFMC. Some of these opportunities that are being investigated are shown on the next page.

“Environmentally responsible technologies that can potentially reduce or eliminate a wastestream in the weapon system life cycle are often well worth the investment. Developing them into leading edge processes and product changes that allows the Air Force to get the job done, but cleaner and safer for you and I, our children and grandchildren.”

The repeated success of advocating funding is due to the success of transitioning promising environmental technologies. The success of transitioning promising technologies is due to doing our homework, then applying some key teaming dynamics: selecting the right team member for the job, providing constant feedback, knowing when to ‘switch gears’, and maintaining a seamless team among government and industry.”

Charles R. Valley,  
Senior Environmental Scientist  
ASC/ENVV  
DSN 785-3567

“The number one priority of the Air Force is to accomplish its mission, but part of that mission is environmental stewardship, we have to leave this planet of ours in better shape then we found it, the way to do that is to eliminate the pollution before we have to clean it up.”

Richard I. Slife  
Chief, Environmental and  
Safety Compliance Branch  
WR-ALC/MAPE  
DSN 468-1197 x139

- ◆ Installation of another FLASHJET® unit at WR-ALC to critical component stripping
- ◆ Installation of the FLASHJET® at Oklahoma Air Logistics Center (OC-ALC) to support radome stripping of various aircraft including the B-52 and KC-135.

#### Available Resource for Further Information

- ◆ Flash Tech Inc. Web site at <http://www.flashtech-inc.com>
- ◆ Joint Service Pollution Prevention Opportunity Handbook: [http://p2library.nfesc.navy.mil/P2\\_Opportunity\\_Handbook/5\\_16.html](http://p2library.nfesc.navy.mil/P2_Opportunity_Handbook/5_16.html)
- ◆ SERDP Fact Sheet: “Aircraft Depainting Technology” at: <http://www.serdp.org>
- ◆ ESTC Fact Sheet, “Tri-Service Demonstration/Validation of the Pulsed Optical Energy Decoating (FLASHJET®) Process for Military Applications,” at: <http://www.estcp.org>
- ◆ Army Environment Center at: <http://www.aec.army.mil/usaec/technology/p2compliance05.html>
- ◆ AFMC’s Solutions Database at: [https://www.en.wpafb.af.mil/p2\\_solutions/p2\\_solutions.asp](https://www.en.wpafb.af.mil/p2_solutions/p2_solutions.asp) ●

---

## PREKOTE: AN ALTERNATE SOLUTION TO THE USE OF CHROME CONVERSION COATING

Headquarters Air Force Material Command Pollution Prevention Integrated Product Team (HQ AFMC P2IPT) has, in part, funded the transition of Prekote (formerly known as X-IT Prekote) for the F-16 aircraft at Ogden Air Logistics Center (OC-ALC). PreKote is an alternative solution to the use of chrome conversion coating (CCC). PreKote offers excellent adhesion, improved paint flexibility, and superior corrosion protection on painted surfaces. PreKote can reduce paint preparation time and costs by up to 40% compared to other hazardous material and process currently used.

Details related to the AFMC funded portion of this technology transfer effort are documented in the *Solutions* Database and some of the key points related to this solutions are provided below.

### Process Description

**PreKote** (Diethylene glycol monobutyl ether, n-methyl pyrrolidone), manufactured by Pantheon Chemical Company, is a nonchromated surface preparation used as a prepaint surface treatment for aluminum, magnesium, stainless steel, titanium, and carbon steel. It promotes paint bonding at



a molecular level, resulting in superior adhesion, improved corrosion resistance and increased flexibility.

**PreKote** is biodegradable, non-toxic, non-flammable, non-hazardous, non-corrosive, and free of phosphates and heavy metals. The ideal application procedure is spraying and scrubbing the surface and then air-drying. The process is repeated a second time and then the surface is immediately rinsed. This procedure eliminates the need of soap wash, solvent wipe down, CCC and acid brightener steps.

Some of the benefits of **PreKote** include the following:

- ◆ Decreased use of solvents, detergents, CCC and acid brighteners.
- ◆ Corrosion resistant anodize surface is preserved because less sanding is required to get the desired paint adhesion.
- ◆ Same process is used on aluminum, titanium, and magnesium.
- ◆ Decreased step for paint preparation which saves both time and money in painting the aircraft.

### Measurement of Success

The Air Force has approved the use of **PreKote** on the T-37, T-38, T-1A, and the F-16 aircraft. There were two major factors for the successful transition of this technology at OO-ALC. The first factor was the advocacy provided by Richard Buchi to ensure sufficient data was collected to answer the questions and concerns of all stakeholders. A second factor, which usually drives successful P2 transition efforts, was the increased flow time from the process change. Approval for the use of Prekote on the F-16 was driven as much for production improvement as for the associated environmental benefits. The process change achieved a 35% reduction in labor to prepare and paint an aircraft, which translates into a \$6,000 savings per F-16 aircraft.

### Additional Opportunities for AFMC Transition

Richard Buchi is working with the C-130 System Program Office (SPO) to transition PreKote to this platform. This

technology has Air Force wide applicability.

### Available Resource

- ◆ Pantheon Chemical: <http://www.panthenchemical.com>
- ◆ ProAct's Cross Talk: <http://www.afcee.brooks.af.mil/pro-act/cross/ed104.asp>
- ◆ AFMC's Solutions Database: [https://www.en.wpafb.af.mil/p2\\_solutions/p2\\_solutions.asp](https://www.en.wpafb.af.mil/p2_solutions/p2_solutions.asp) ●

"The number one reason that PreKote has been successful is its great adhesion that has resulted in no reworks for F-16 SPO. Other reasons are workers health/safety, environmental advantages, cost and time savings, and the fact that PreKote is much more forgiving than Alodine.

To complete the transition of the PreKote Process throughout the Air Force, other SPOs need to accept its use as the process is already in the T.O. 1-1-8.

The stakeholders that made this effort a success include the F-16 SPO, Major Dan Bullock AFPCO, Owen and Ruth Jett AFPCO, CTIO Office, John H Stallings ASC/GRE, Ken Patterson AFRL/MLS-OL, Wayne Patterson and Clyde Gowers from OO-ALC/MADL."

Richard H. Buchi  
Materials Engineer  
OO-ALC/MADL  
DSN 775-2993

## INFORMATION CROSS-FEED

### THE DEPARTMENT OF DEFENSE (DoD) ESTABLISHES A FORUM TO ADDRESS CORROSION

The total cost of corrosion to the U.S. Economy is \$276 Billion per year. The total cost of corrosion for the Department of Defense is \$20 Billion per year. A General Accounting Office Report concluded that corrosion poses numerous safety risks and impacts military costs and facilities readiness by substantial equipment degradation. Public Law 107-314 requires the Department of Defense (DoD) to develop and implement a long-term strategy to reduce the effect of corrosion on military equipment and infrastructure.

<p align="center"><b>Department of Defense</b>  <b>Daniel J. Dunmire</b>          Director, Corrosion Policy and Oversight          Office of the Under Secretary of Defense (AT&amp;L)          2001 North Beauregard St., Suite 210          Alexandria, VA 22311          703-681-3464</p>		
<p><b>Facilities – US Army</b>          US Army Engineering Research and Development Center/ Construction Engineering Research Laboratory (ERDC/CERL)          2902 Newmark Drive          Champaign, IL 61822-1076          217-373-6753  <a href="http://www.erdcl.usace.army.mil/">http://www.erdcl.usace.army.mil/</a></p>	<p><b>US Army</b>          HQ Army Materiel Command          5001 Eisenhower Ave          Alexandria, VA 22333          703 617-9840  <a href="http://www.amc.army.mil/">http://www.amc.army.mil/</a></p>	
<p><b>Facilities – US Air Force</b>          HQ Air Force Civil Engineer Support Agency/CESM          139 Barnes Drive, Suite 1          Tyndall AFB FL 32403          850-283-6215  <a href="http://www.afcesa.af.mil/">http://www.afcesa.af.mil/</a></p>	<p><b>US Air Force</b>          Air Force Corrosion Prevention and Control Office          AFRL/MLS-OLR          325 Richard Ray Blvd          Robins AFB GA 31098-1639          478-926-3284  <a href="https://afcpco.robins.af.mil/">https://afcpco.robins.af.mil/</a></p>	
<p><b>Facilities – US Navy</b>          Naval Facilities Engineering Support Center          1100 23rd Avenue          Code ESC 63          Port Hueneme, CA 93043-4370          805 982-1057  <a href="http://www.navfac.navy.mil/">http://www.navfac.navy.mil/</a></p>	<p><b>US Marine Corps</b>          Marine Corps Systems Command          Code ACENG / ES&amp;P          2033 Barnett Ave Ste 315          Quantico, VA 22134          703-432-3800  <a href="http://www.marcorsyscom.usmc.mil/">http://www.marcorsyscom.usmc.mil/</a></p>	
<p><b>US Navy</b>          Office of Naval Research          ONR 332          800 N Quincy St.          Arlington, VA 22217          703 696-4309  <a href="http://www.onr.navy.mil/">http://www.onr.navy.mil/</a></p>	<p><b>NAVAIR</b>          Naval Air Systems Command          BLDG 2188, MS5          Patuxent River, MD 20670          301-342-8000  <a href="http://www.navair.navy.mil/">http://www.navair.navy.mil/</a></p>	<p><b>NAVSEA</b>          Naval Sea Systems Command          NAVSEA 05M1          1333 Isaac Hull Ave. SE          Washington Navy Yard, DC 20376-5131          202-781-3671  <a href="http://www.navsea.navy.mil/">http://www.navsea.navy.mil/</a></p>

Since the first Corrosion Forum that was held in May 2003, a series of meetings and workshops have been underway to establish a DoD forum to address this critical issue. Each service has appointed a representative to the Corrosion Forum and a core team has been working on the following products:

- ◆ Developing an Overarching Corrosion Policy – the policy will include facility related issues, life cycle cost evaluation, and establishing a single DoD process policy for qualification of corrosion prevention technologies.
- ◆ Defining DoD Corrosion Related Requirements – which includes collecting and assessing programmatic and technology requirements.
- ◆ Assessing DoD Costs & Risk - which involves assessing the corrosion related impacts to readiness, safety, logistics footprint, budgets, facility deterioration, and unpredictable outcomes.

- ◆ Enhancing DoD Communication & Outreach - which involves initiating a Office of the Secretary of Defense (OSD) Corrosion Control website.
- ◆ Making Training Available to the DoD Workforce - this requires identifying positions for which corrosion training or certification will be mandatory.
- ◆ Defining Common Problems & Solutions – this requires establishing knowledge sharing at all levels, across all Services.
- ◆ Planning for Programs/Projects - this includes review of current corrosion related program and funding levels and planning for funding of future programs to mitigate the impact of corrosion.

If you would like more information about this initiative, please contact your service member or visit <http://www.dodcorrosionexchange.com>. ♦

## 2004 DEICING WORK GROUP HELD IN LAS VEGAS, NEVADA



(AFMC) and a Deicing Program was started at Aeronautical Systems Center (ASC) in 2001. For 2004, in order to address the need for information exchange among users, acquisition, and research deicing communities a Deicing Workshop, hosted by ASC and Air Force Research Laboratory (AFRL), was presented on 15-17 March in Las Vegas NV.

The Deicing Workshop was held to promote information exchange among deicing stakeholders, discuss problems, and identify potential courses of action. The workshop was primarily focused on aircraft, runway, and in-flight deicing. Special emphasis was placed on operational concerns, present practices, and emerging

The Air Force has experienced an increase in environmental and operational issues with deicing activities at Air Force facilities world-wide. A deicing focal point was designated to address these issues for Air Force Materiel Command



**Col Johnny Smith**  
Commander, 57th Maintenance Group  
Nellis AFB

technologies. In addition, the workshop covered lessons learned and operational requirements that lead to material solutions, changes to applicable Technical Orders and Instructions.

To this end, 86 attendees enjoyed an effective and informative workshop. The attendees were of a broad cross-section from all facets and fields of deicing. The attendees included users from Major AF Commands who deal with deicing issues at bases; System Program Office representatives; Single Managers; Civil Engineers; and representatives from the Pentagon, Army, Navy; Federal Aviation Administration (FAA), and from industry.

Information sharing occurred from top-to-bottom in matters of policy; and from bottom-to-top in matters of lessons learned. According to several attendees the presentations and discussions were quite informative, as well as quite lively with attendees enthusiastically exchanging information and viewpoints.

Presentations focused on deicing fluids, equipment, facilities, ice detection, and future technologies, such as ice phobic materials and hangar type infrared deicing equipment.

The end result of the workshop was to provide deicing and flying capability to the warfighter, while maintaining environmental compliance.

If you would like a copy of the proceedings from this meeting and/or any additional information on this working group, please contact Ms. Mary Wyderski at 937-656-6178.

*This article was submitted by Ms. Mary Wyderski. ●*

#### ◆ Operational Discussion Day

- Government only - AF, Army, FAA
- Aircraft and Runway Deicing/Anti-icing
- Inflight Icing/Deicing

#### ◆ General Session – Day 1

- Deicing Equipment and Facilities
- Deicing/Anti-icing Fluids
- DoD and Commercial Deicing Programs

#### ◆ General Session - Day 2

- Ice Detection
- Deicing Training
- Future Technologies
- In-flight Icing/Deicing
- Environmental Challenges and Requirements

#### 2004 Deicing Working Group Planning Team

Alexei Lozada-Ruiz, ASC/YTEV

Capt Tim Allmann, AFRL/MLSC

Lee Gulley, AFRL/MLSC

Dennis Knotts, HQ AFMC/LGPEV

Bob Giroux, 3 EMS/MXM

Dr. Charles Ryerson, ERDC-CRREL-NH

Don Tarazano, SAIC

James Davila, SAIC

#### Others

Frank Brown, ASC/ENNV

Martha Vaillancourt, ASC/ENNV



## THE MONITOR ON INTERNET

This issue of the MONITOR is available on the Internet at: <http://www.ascenv.wpafb.af.mil>. The current issue of the MONITOR is a Portable Document Format (PDF) file which requires a reader program for viewing or downloading. The Adobe Acrobat reader is available for downloading at no cost. Historical issues of the MONITOR are available on the Internet at: [http://www.engineering.wpafb.af.mil/esandh/envv\\_monitor.asp](http://www.engineering.wpafb.af.mil/esandh/envv_monitor.asp)

---

### **BEST PRACTICES: DIGITIZATION OF ALL F-16 TECHNICAL ORDERS**

The F-16 International Technical Order Digitization (ITOD) Program represents a best practices for the Air Force as this effort responds to the Department of Defense's Electronic Commerce Initiative and the Air Force's Lightning Bolt Initiative for reduction in total ownership costs. Transitioning technical documentation from paper to an electronic format has an estimated cost savings of 24% from leveraging commonality of 1.4 million pages of F-16 technical manuals across 24 countries. Estimates indicate about 60% of this information is common across the 24 countries. The current effort is paving the way for a similar effort for the F/A-22 and the Joint Strike Fighter (source: <http://www.f-16net>)

---

---

### **AIR FORCE IS BUYING LAND AND EASEMENT RIGHTS AT LUKE AFB**

The Air Force is planning to buy 273 acres around the munitions-storage area south of Luke AFB for \$6 billion to better protect the transport of live ordnance to the base's flight line. An additional \$21.3 million is being used to buy land or easement rights for 1,700 acres in which represent the only route left for F-16 pilots to conduct live-armed flights to the Barry M. Goldwater Range in Arizona. Environmental documentation is currently underway for this action (source: <http://www.f-16net>).

---